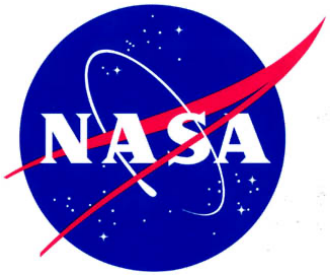

2023 Heliophysics Space Weather Vigil Focused Mission of Opportunity (Vigil FMO)

Questions & Answers

16 June 2023

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Questions & Answers

Please submit your questions regarding the 2023 Heliophysics Space Weather Vigil Focused Mission of Opportunity (Vigil FMO) to Dr. Jim Spann by email at: jim.spann@nasa.gov.

We will work to develop answers to your auestions, and post those answers to this document. Please check back for the latest version, as you may not be notified that your question has been answered.

Change Log		
Rev.	**Date**	**Description of Changes**
01	08 FEB 2023	Added Q&A 1
02	15 MAR 2023	Added Q&A 2 that superseded Q&A 1
03	16 JUN 2023	Added Q&As 3 to 8

Q1: ~~Why is the Draft Announcement of Opportunity (AO) structured more like a Request for Proposal (RFP) than a typical open science AO?~~

A1: ~~This AO is for an investigation to support an operational space weather mission, as well as to conduct research. Therefore, it has aspects of both an RFP and an open science AO. The table listing operational requirements addresses the performance characteristics for operations and is not expected to constrain what science can be proposed for the specified instrument.~~ [Superseded by Q&A 2 on 15 March 2023.]

Q2: Why does the solicitation appear to be driven by instrument requirements in the Level 1 Operational Parameters and Targets Table that seem to emphasize specific space weather operations over a focused, but open science investigation?

A2: This FMO solicitation is for a science investigation that uses/includes a remote sensing instrument—a NASA Instrument of Opportunity (NIO)—whose observations complement the operational observations of the Vigil space weather mission on which the instrument is hosted.

The science investigation is expected to:

- advance understanding of solar variability manifested as “the sudden release of magnetic energy that enables both flares and coronal mass ejections (CME) to accelerate particles to high energy efficiently”;
- enable the development “of advanced methods for forecasting and nowcasting of solar eruptive events and space Weather”; and
- make effective use of ESA instrument data in the proposed investigation.

The investigation is also expected to support objectives of the Vigil mission with the provision of low-latency observations for operational space weather applications, particularly observations of the solar atmosphere necessary to monitor and predict conditions determining space weather in the region of Earth. In the context of the Vigil mission objectives, the solar atmosphere consists of the region between the photosphere and the near-radial corona. Thus, the FMO should fill in the observational gap between the Vigil mission’s Photospheric Magnetic Field Imager (PMI) and the Compact Coronagraph (CCOR). Latency and cadence of FMO observations must be compatible with that of the baseline Vigil instruments.

The priority Vigil-complementary observational objectives for the NIO will be

- Identify the morphology of inner coronal structures including active regions, coronal holes, and quiet Sun. The observational cadence, resolution, field of view and temperature coverage should be sufficient to:
    - Determine connection between PMI observations of photospheric magnetic field by the PMI and observations of extended coronal structures by the CCOR.
    - Evaluate the magnetic complexity and connection of coronal structures.
    - Define the structure of coronal holes sufficient to project the boundaries of high-speed solar wind streams.
    - Establish the temperature of these structures sufficient to characterize their evolution.
- Identify transient coronal activity including flares, prominence eruptions and markers of coronal mass ejections (CME) such as EUV dimming. The observational cadence, resolution, field of view and temperature coverage should be sufficient to:
    - Identify the active region associated with any X-ray flare of Class-C of greater.
    - Establish the magnetic connectivity of a prominence prior to eruption.
    - Determine the direction and speed of CME markers such as prominence. eruptions, coronal dimmings and coronal streamer displacement.
    - Track the markers of Earth-directed CME to at least 1.8 solar radii.

The requirements in the Level 1 Operational Parameters and Targets table were applicable for the strawman instrument generated as the mission was being developed and represented but one example of how the Vigil-complementary operational objectives could be met. The strawman instrument was also necessary for establishing appropriate mass and volume resource allocations for payload planning. The table was not meant to define a/the specific instrument for the solicited investigation and will be removed in the final AO in favor of the objectives above.

Q3: Given that this FMO is for an instrument, Requirements 15–17 in the DRAFT AO's Section *5.1.8 Planetary Protection* and Requirement B-54 in the DRAFT AO's Appendix J.6. Planetary Protection Plan do not seem applicable, as the FMO Team will not have any control over the spacecraft.

A3: The referenced requirements, section, and appendix will not be levied on proposals in the final AO.

Q4: Given that this FMO is for an instrument, Requirement 28 in the DRAFT AO's Section *5.2.4 Orbital Debris Assessment and End-of-Mission Spacecraft Disposal Requirement* and Requirement B-55 in the DRAFT AO's Appendix J.8. Discussion of Limiting the Generation of Orbital Debris and End of Mission Spacecraft Disposal Requirements do not seem applicable, as the FMO Team will not have any control over the spacecraft.

A4: The referenced requirements, section, and appendix will not be levied on proposals in the final AO.

Q5: Given that this FMO is for an instrument, Requirement 30 in the DRAFT AO's Section *5.2.6 Project Protection Plan* does not seem applicable, as the FMO Team will not have any control over spacecraft commanding.

A5: NASA-STD-1006A provides suggested tailoring regarding instrument command stack protection and interference reporting guidance for hosted instruments that must be considered in addressing DRAFT AO Requirement 30. Other aspects of NASA-STD-1006A, such as the necessity of protecting the confidentiality of Command Link Critical Program/Project Information (CPI) as controlled unclassified information (CUI), must also be addressed.

Q6: The DRAFT AO does not specify the length of Phase E. Is it 7.5 years as shown in the ESA document VGL-IRD-ESA-NIO-0037 Issue 1.0 *VIGIL MISSION NASA INSTRUMENT OF OPPORTUNITY (NIO) INTERFACE REQUIREMENTS DOCUMENT*, page 16?

A6: No. Proposers should assume a three (3) year Phase-E duration comprising one (1) year between 32.3 degrees separation from Earth with respect to the Sun and the 5th Sun-Earth Lagrangian point (SEL5), followed by two (2) years at SEL5. Checkout should be assumed to be for one (1) month, between 30 and 32.3 degrees separation from Earth with respect to the Sun.

Q7: Is additional instrumentation permitted, as long as the overall package meets the Payload IRD and AO Cost Cap?

A7: Yes. The instruments must, however, be integrated into a package that constitutes a single interface to Vigil.

Q8: Please clarify the nature of requirement VGL-NIO-IF-0290 "[t]he instrument latency of the data shall be less of equal to 5 minutes" in ESA document VGL-IRD-ESA-NIO-0037 Issue 1.0 *VIGIL MISSION NASA INSTRUMENT OF OPPORTUNITY (NIO) INTERFACE REQUIREMENTS DOCUMENT*.

A8: This is a requirement for the instrument latency onboard the spacecraft, i.e., the operations data should be passed to the spacecraft data bus by the instrument within 5 minutes of the observation.